

(12) UK Patent Application (19) GB (11)

2 161 194 A

(43) Application published 8 Jan 1986

(21) Application No 8417007

(22) Date of filing 4 Jul 1984

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(51) INT CL<sup>4</sup>  
E06B 9/52

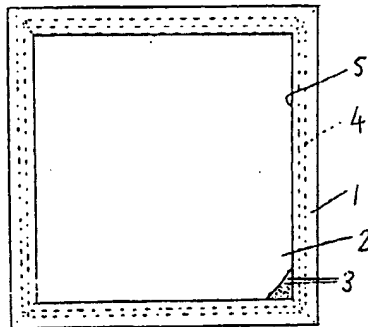
(52) Domestic classification  
E1J GS

(56) Documents cited  
GB 1463531 GB 1427996 GB 1271690  
GB 0603186

(58) Field of search  
E1J

(54) Flyscreen

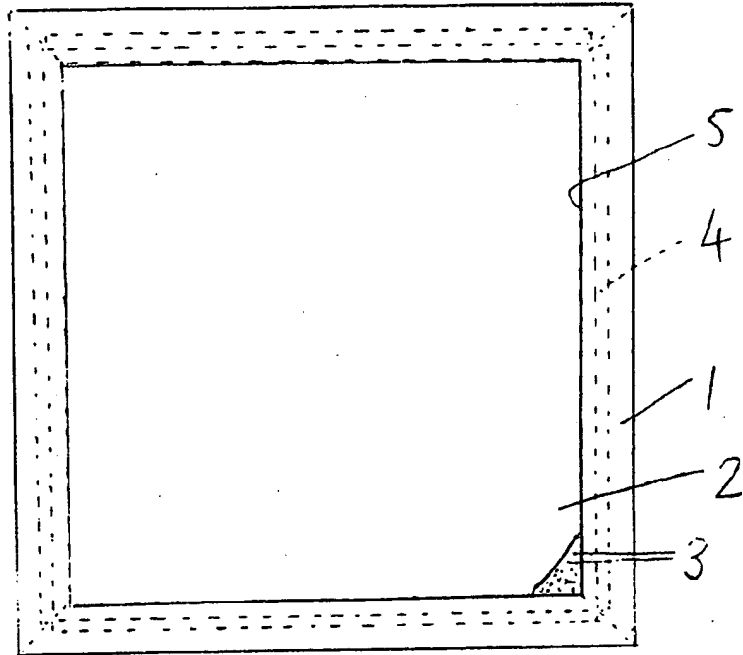
(57) A screen for excluding insects is formed of perforated transparent plastics film. Where the screen is to exclude insects from penetrating a door or window opening 5, it may be put in place using any suitable means such as double-sided adhesive tape 4 and the film 3 may subsequently be heat shrunk in situ.



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## SPECIFICATION

## Window screen

5 The present invention relates to a screen, and in particular to a screen which can be placed over an opening such as a window or door to allow light to pass through but to exclude insects.

Traditionally insects have been excluded by the use of either a fine mesh woven fabric or a fine mesh metal screen. However, although these two known solutions have been used for many decades, there has always been the disadvantage that the light transmissivity of the screen is poor.

15 A screen of the fabric or metal type has previously been employed during warmer climatic conditions and is normally able to be removed from the frame around the aperture when it is not required (for example in colder weather) and when there is less intense day-light which is to be impeded to the minimum extent possible.

It is also known to use secondary glazing in colder climatic conditions, where a removable glazed frame is able to be placed over a window opening to form a sound-deadening or thermally-insulating pocket of air between the main glazing of the window and a secondary glazing.

It has also been proposed, in the past, to provide this secondary glazing in the form of a plastics film temporarily held in place on the window frame, for example as disclosed in U.S. Patent No. 3,075,248 where a sheet of shrink film has been clamped in place over the window opening and then shrink-tied, for example by use of a domestic hair-dryer.

35 In the past these two different applications, the secondary glazing on the one hand, and the insect screen on the other hand have been used in different seasonal conditions and for entirely different uses.

According to one aspect of the present invention we provide a method of excluding insects, comprising providing an air-permeable screen of perforated transparent plastics material, the perforations being small enough to exclude undesirable insects.

A second aspect of the invention provides a method of providing an insect-exclusion screen over an aperture, comprising stretching a film of transparent plastics material over the aperture, the film having been finely perforated so as to be air-permeable but to exclude undesirable insects.

50 A further aspect of the present invention provides a kit of parts for screening an aperture, comprising a sheet of finely perforated transparent plastics film, the fineness of the perforations being adequate to render the film air-permeable but to prevent undesirable insects from penetrating the film, and means for securing the film in place over an aperture, the film being heat-shrinkable.

Yet a further aspect of the present invention provides an air-permeable insect exclusion screen comprising a sheet of transparent perforated film stretched taut over an aperture to exclude insects from passing through the aperture.

65 Preferably the film is secured directly to the perimeter of the aperture without the need for any removable supporting frame to carry the film.

Advantageously the film is a heat-shrinkable film which has been brought into the taut condition by application of heat after the film has been put in place.

In order that the present invention may more readily be understood the following description is given, merely by way of example, with reference to the accompanying drawing in which the sole Figure shows a sheet of perforated plastic film stretched taut over a window frame, in accordance with the present invention.

70 The drawing shows the window frame 1 having a film 2 stretched taut over the window aperture, the film 2 including a plurality of perforations 3 as shown schematically in the bottom righthand corner of the window.

80 The window frame comprises four members defining a rectangular aperture and parallel to each of these members is a securing strip 4, in this case double-sided adhesive tape having one adhesive face to bond to the window frame and the other to attach to the plastics sheet. Any other securing means can be used instead of adhesive tape.

Although, in the drawing, the plastics sheet 2 has a neat rectangular perimeter which coincides with the perimeter of the window frame 1 itself, it will of course be understood that in practice the film may be slightly smaller than or slightly greater than the external perimeter of the frame, provided of course that the film adequately closes the aperture 5 of the window frame.

In the preferred embodiment of the window screen, the film 2 is initially placed in contact with the frame 1 in a substantially flat configuration but not under any appreciable tension, and then heat is applied, for example by way of a domestic hairdryer, to shrink the film in place. For this operation it is necessary that the film used be of a heat-shrinkable type in which latent shrink energy imparted to the film by bi-directional orientation of the film can be released by the application of shrinking heat.

In this preferred example the shrink film, which is highly transparent, additionally includes an optional ultra-violet absorber as a means of screening the occupants of the room against ultra-violet radiation, while allowing the maximum possible transmission of visible light.

The film may be mechanically perforated by means of hot needles, or flame-perforated, or perforated in any other manner, as desired.

115 Although in the preferred example there is no separate frame to hold the perforated transparent film in place, it is conceivable for such a frame to be provided and it may be particularly advantageous for the frame to be enclosed within a tube of the perforated plastics film such that the film may be heat-shrunk onto the frame to provide the necessary tightness of the film on the frame.

Various examples of plastics composition for the film may be used, and the film may either be a mono-component film or a multi-layer film. For example, one suitable film may be of shrinkable polyethylene.

Another example is a four-ply co-extruded shrinkable film having a thickness of from 15 to 30 microns and a composition A/B/A/B where:—

A is polypropylene; and  
B is 85% propylene-ethylene (as a 96/4 co-polymer)  
and 15% polypropylene.

Yet a further example of a suitable film is a three-ply  
5 co-extruded shrinkable film having a thickness of from  
15 to 30 microns and composition A/C/A where:—

A is polypropylene; and  
C is linear low-density polyethylene.

Yet a further suitable film is linear medium density  
10 polyethylene having a thickness of from 15 to 30  
microns, and irradiated to an intensity of 6 Megarads.  
This film is shrinkable.

One particularly preferred composition is linear  
medium density polyethylene irradiated to an intensi-  
15 ty of 10 Megarads, with a thickness of 25 microns.

Such a film is sold by Minnesota Mining and  
Manufacturing Company under the Trade designation  
"RD101". Naturally, each of these varieties of film will  
have been perforated to give holes which are prefer-  
20 ably smaller than the size of a mosquito. For example,  
there may be 200 holes per square inch (31 holes per  
square centimeter) each having a diameter of 0.9 mm.

Although the aperture 5 is shown as unobstructed, it  
will of course be appreciated that the conventional  
25 window casements or sashes have been omitted, for  
clarity.

Furthermore, the same principle of mounting the  
insect-excluding film in place over a window opening  
can be extended to the provision of an insect screen in  
30 a doorway.

Although in the preferred embodiment described  
above the use of plastics film has been disclosed for an  
insect-excluding screen in a window aperture, it is of  
course possible to use the perforated film in a door  
35 aperture or in other insect-exclusion applications, in  
place of conventional mosquito netting. For example,  
in some tropical areas mosquito netting is placed over  
a bed to protect the occupant against insect attack  
while sleeping, and the perforated transparent plas-  
tics film used to screen the window aperture 5 in the  
40 drawing can be used for that alternative application.

If desired, the film used may be tinted, for example  
by means of a coloured resin, and may then serve as a  
sun-screen. Alternatively or additionally the film may  
45 be printed, in order to provide a decorative effect or for  
any other purpose. By 'printed' we mean that the film  
bears a printed image on an 'image-bearing' part of its  
surface area, and is plain on the 'non image-bearing'  
remainder of its surface.

## 50 CLAIMS

1. A method of excluding insects, comprising  
providing an air-permeable screen of perforated  
transparent plastics material, the perforations being  
small enough to exclude undesirable insects.

55 2. A method of providing an insect-exclusion  
screen over an aperture, comprising stretching a film  
of transparent plastics material over the aperture, the  
film having been finely perforated so as to be  
air-permeable but to exclude undesirable insects.

60 3. A method according to claim 3, wherein the step  
of stretching the film taut over the aperture comprises  
attaching a heat-shrinkable film to a wall or a frame  
around the perimeter of the aperture to be screened,  
and then applying shrinking heat to the film to impart  
65 the required tension in the film.

4. A method according to claim 3, wherein the  
shrinking heat is applied to the film by means of a  
domestic hairdryer.

5. A method according to any one of the preceding  
70 claims, wherein the film has been perforated by use of  
hot needles.

6. A process according to any one of claims 1 to 4,  
wherein the film has been perforated by a flame  
perforation process.

75 7. A kit of parts for screening an aperture, compris-  
ing a sheet of finely perforated transparent plastics  
film, the fineness of the perforations being adequate  
to render the film air-permeable but to prevent  
undesirable insects from penetrating the film, and  
80 means for securing the film in place over an aperture,  
the film being heat-shrinkable.

8. A kit according to claim 7, wherein the film is  
shrinkable polyethylene irradiated to at least 6  
Megarads.

85 9. A kit according to claim 7 or 8, wherein the film  
has a thickness of from 15 to 30 microns.

10. A kit according to any one of claims 7 to 9,  
wherein the film is perforated with substantially 31  
holes per square centimeter.

90 11. A kit according to any one of claims 7 to 10,  
wherein the perforation holes have a maximum  
diameter of 0.9 mm.

12. A kit according to any one of claims 7 to 10,  
wherein the means for securing the film in place  
95 includes a frame which is removable in the aperture to  
be screened.

13. A kit according to claim 12, wherein the film is  
tubular film and the tube is large enough to enclose  
the frame within the tube.

100 14. A kit according to any one of claims 7 to 13,  
wherein the film includes an ultra-violet absorbing  
constituent.

15. An air-permeable insect exclusion screen com-  
prising a sheet of transparent perforated film stretch-  
105 ed taut over an aperture to exclude insects from  
passing through the aperture.

16. A screen according to claim 15, wherein the  
film includes an ultra-violet absorbing constituent.

17. A kit according to any one of claims 7 to 14 or a  
screen according to either of claims 15 and 16,  
110 wherein the film is tinted.

18. A kit or a screen according to claim 17, wherein  
the film includes a coloured resin.

19. A kit according to any one of claims 7 to 14, 17  
115 and 18, or a screen according to any one of claims 15  
to 18, wherein the film is printed with an image  
covering a part of its surface area.

20. A method of excluding insects, substantially as  
hereinbefore described with reference to the accom-  
120 panying drawing.

21. A kit of parts for exclusion of insects, substan-  
tially as hereinbefore described with reference to, and  
as illustrated in, the accompanying drawing.

22. An insect exclusion screen substantially as  
hereinbefore described with reference to, and as  
125 illustrated in, the accompanying drawing.